NEW-YORK FARMER,
AND
AMERICAN GARDENER'S MAGAZINE.

"Agriculture at once the cause and evidence of civilization."

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D. K. MINOR, and GEO. C. SCHAEFFER, } EDITORS AND PROPRIETORS. FOR MAY 29, 1837. NEW SERIES—VOL. V.

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NEW-YORK FARMER.

MAY 29, 1837.

THE NEW-YORK FARMER AND AMERICAN GARDENERS' MAGAZINE,

Will be *hereafter*, for the *remainder of this Volume*, published *semi-monthly*, in numbers of sixteen pages each. It has *heretofore* been published in *monthly parts*, *stitched*, and of course subject to *pamphlet* postage, which is, with many, an objection to the work; and *others* desire to receive the work more *frequently*. In order, therefore, to obviate this objection, and to gratify this reasonable desire, especially at *this* time, when agricultural pursuits are becoming more fashionable with many of our citizens than heretofore, we have concluded to commence the publication *semi*-monthly, and to send it to subscribers in the form of most *other* agricultural papers, without cover.

This arrangement will enable us to appropriate a small space in each number to advertisements, and we therefore solicit such as are appropriate, and may be desired by readers of agricultural publications.

MECHANICS' FAIR IN BOSTON, MASS.—We give the following notice of the Board of Managers of the MASSACHUSETTS CHARITABLE MECHANICS' ASSOCIATION, for their First Annual Fair, to be held in September next. We are gratified to see that the Mechanics' of Boston are not to be outdone by other cities, in the establishment of such institutions for the benefit of industrious and enterprising Mechanics. We anticipate a splendid exhibition of New-England ingenuity, industry and skill.

MECHANICS' FAIR.

Notice to Mechanics, Artisans, Manufacturers, &c.—The undersigned give notice that the first Annual FAIR of the Massachusetts Charitable Mechanics' Association will be held in the city of Boston, in September next, commencing on Monday, the 18th, and continuing at least three days.

The Association have placed at the disposal of the Board of Managers, the sum of Five Thousand Dollars, to enable them to conduct the Fair upon a liberal scale; and they hope to be able to render satisfaction to all who may feel disposed to offer articles for exhibition.

Medals or Diplomas will be awarded to the owners of all articles that may be deemed worthy of such distinction; and the Managers intend that the strictest impartiality and fairness shall be observed in the distribution of Premiums.

The Managers, in furtherance of the object they have in view, invite contributions of articles from every department of industry; of choice specimens of American ingenuity and skill; rare and valuable domestic productions, natural or artificial; the delicate and beautiful handiwork of females; useful labor-saving machines, implements of husbandry, and new models of machinery, in all their varieties.

Judges will be appointed to examine all articles offered, and the managers will award a gold or silver medal, or a diploma, to all articles that may be pronounced by the judges worthy of reward.

Articles intended for exhibition, must be delivered on or before Wednesday, September 13th.

Arrangements will be made to exhibit, *in operation*, any working models that may be offered, which will render the exhibition useful and interesting, and the managers respectfully invite contributions in this branch. A careful and competent superintendent will be appointed to take chare of all models sent for this purpose.

Board of Managers.

Stephen Fairbanks,	Jos. T. Buckingham,
John Rayner,	James Clark,
William Adams,	Henry W. Dutton,
Uriel Crocker,	George Darracott,
Gardner Greenleaf,	Wm. S. Pendleton,
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Thomas J. Shelton,	George G. Smith,

John G. Rogers.

P. S. For any further information address JAMES L. HOMER, Corresponding Secretary, Boston.

Boston, March 24, 1837. m28–ts1

POPPY SEED OIL.—Many of our readers will probably recollect that we published a communication in the January No. of the Farmer on the subject of *Poppy Seed Oil*. The facts set forth in that communication attracted the attention of some of our readers, who take a deep interest in the introduction of new branches of industry; and we, at their request, applied to the writer of the communication referred to for more particular information in relation to the mode of cultivation; and we are now gratified to be able to publish the following communication from a gentleman whose statements may be fully relied upon. For this very interesting communication, and the capsules containing some of the seed, which we shall plant with great care, he will please to accept of our thanks, and the numbers of the Farmer which we forward to him. We shall look with much interest for further

communications on this subject from the same pen, and also in relation to the cultivation of *Madder*. If convenient we should be much obliged to Mr. Bishop, at a suitable time, for a few seeds, or roots of the Madder to plant.

For the New-York Farmer.

Mr. Minor.—Dear Sir: Your letter of the 10th inst. to E. S. Scripture, has been handed me, with a request to answer your several inquiries in relation to the cultivation of the Poppy and Madder. You inquire, 1st. What kind of Poppy is best? 2d. What kind of soil is the best? 3d. How do you plant or sow it? 4th. At what time should it be planted or sowed? 5th. How much seed to the acre? 6th. How do you cultivate it? 7th. How do you gather it? &c., &c. As I have some practical knowledge of its cultivation, I cheerfully answer the above inquiries, so far as my experience and information enable me to do. In answer to the first inquiry, I send you some of the seed capsules, containing the seed. This species of the Poppy, having imperforate seed capsuls, appears altogether the best adapted for cultivation for obtaining seed, as you will readily perceive, on examination, as the perforate, or open seed capsules, would render the gathering of the crop tedious and expensive.

2d. This species of the Poppy has a very general adaptation to all the different soils usually met with in this State. Yet when cultivated as a field crop, for the purpose of obtaining oil from the seed, it should have a warm dry soil,—either sand and loam, or loamy gravel. Planted on a deep, moist, and very rich soil, it continues to shoot up lateral branches which bud and blossom until killed by very severe frosts. Under such circumstances, we can never have that perfect and simultaneous maturity of the bolls which is necessary to obtain a good crop of seed. This difficulty, however, can be obviated in a great measure, if not entirely, by the method of sowing and cultivation mentioned in answering your 3d inquiry.

3d. Sow the seed in drills, eight inches apart, and four inches in the drill, with as light a covering as practicable. If the weather be damp and rainy immediately after sowing, the seed will vegetate in a few days. The objections to sowing broad cast are, that much of the seed is covered too deep if the common harrow is used, and that so small a portion of it has an equal covering of earth, the crop will never be uniformly ripened. Those seeds having a deep covering either not vegetating at all, or so late in the season that some part of the crop will be fit for harvesting, while another is in blossom, and another with the bud in embryo. This was the case with a field sowed broad-cast, on a deep rich alluvial soil, and was never harvested, winter setting in while a portion of the crop was in blossom, and another in the bud. I have a hand drill, of different construction from any I have examined. It sows the poppy seed with the most perfect accuracy, dropping just one or two seeds at a time. I may, at some future period, send you a drawing of it. Another objection to sowing broad-cast is, the utter impossibility of making a uniform distribution of seed: if however this method *is* practised, the seed should be sown just before rain, having the surface of the field made as smooth and level as may be, and no covering attempted.

4th. Sow the seed as early in the season as a good preparation of the soil can be made.

5th. An acre, with the distances before mentioned, will contain 193,020 plants, and unless there be an unnecessary waste of seed, one pint will prove sufficient for an acre.

6th. The growth of the plant will be so rapid as not to require, or even admit, of much cultivation. The plants should be thinned out when small, and all luxuriant weeds removed that would interfere with, or check their growth. The poppy is very hardy,—not liable to be destroyed by any insects, or injured by early frosts.

7th. Reap it as you do wheat, and bind in bundles. Thresh it upon the barn floor, (which should be very tight,) in the same manner as wheat, and separate the seed from the broken capsule and stalks with a wire seive.

The oil may be extracted in the same manner as from flax seed—and the roller and plate used in the first operation upon flax seed is well adapted for poppy seed. After it has passed through the rollers, a portion of the oil may be taken out for table use—and the cake then broken up, and ground under the stone in the same manner as flax seed—and, after heating in the cylinder, the remainder of the oil may be expressed. The cold expressed oil is very valuable for many purposes. The genuine Macassar oil for improving and beautifying the human hair is the oil of poppy seed. The article is often counterfeited at present, by substituting fine olive oil for the poppy. This deception may be detected in cold weather—the olive oil loosing entirely its fluidity, while the poppy oil is not in the least affected by the most intense degrees of cold.

The quantity of seed an acre of land will produce, must depend very much on the soil and cultivation. If the plants stand singly upon a good soil the distances above mentioned, each one will produce from 4 to 7 heads, or seed capsules, averaging throughout the field 5 to every plant, making 980.100 to the acre. Of those I raised last season, 12 often produced one gill of seed—but this was measured before it was *quite* dry—so that in estimating the average quantity, we will say 25 heads to the gill. This calculation would give the enormous quantity of 150 bushels of seed to the acre.

The experiment has not been made on an acre of ground, which it must be acknowledged is the fairest way of testing the productiveness of *any* crop – but it will be found *practically true*, that an acre of good land, well fitted, will produce 196,020 poppy plants, of vigorous growth, averaging 5 seed capsules each – and in proof of the quantity of seed they contain, you have but to examine those I send you. I shall be able to furnish you with the results of further experiments, as early as the coming October, and will send you some of the seed capsules entire—that you may distribute them among your friends if they are not supplied. In concluding my remarks, for the present, I will say, that, although the enormous quantity of 150 bushels of seed to the acre, will not often, if ever, be realized by the cultivator, owing to negligence and inattention—yet one half the quantity will render this business one of the most profitable branches of agriculture—the value of the seed being at present not less than $2.50 per bushel. In regard to Madder—I have an acre under cultivation, and have availed myself of most of the practical knowledge of our farmers in this region on this subject. I must defer any communication on this subject for a few weeks—probably until after the first *laying* or *soiling*, as I anticipate some innovations upon the customs of our farmers in this matter.

L. Bishop.

Sauquoit, Oneida Co., May 4, 1837.

For the New York Farmer.

AGRICULTURAL TOUR, No. 5.

To Lewis F. Allen, Esq. of Buffalo, well known as eminent, among the intelligent and spirited agriculturists in New-York, I am much indebted for various polite attentions, and much agricultural information. Mr. Allen is spiritedly engaged in endeavors to improve the live stock of the country; and I had the pleasure of seeing in his possession several very fine animals of the improved Durham Shorthorns, which certainly did great credit to his management, and his skill in their selection. I will not undertake to

describe them particularly, as I hope that he will himself in due season favor the public with his success and opinions in this matter The samples of this stock in his possession are of high pedigree and fine promise; and I am particularly anxious that by some continued and exact observations he should determine the dairy properties of his cows. He thinks highly of them in this respect; but in a matter which can be easily tested, we want accurate experiments and observations. Of his improved breed of swine, I can speak in the highest terms. They are not of the largest class, but their extraordinary thrift and admirable forms place them among the best that have fallen under my notice.

Mr. Allen is the general superintendent of the establishment at White-Haven. The saw mill at this place is an interesting object of curiosity. It is one hundred and fifty feet square; it drives six gangs of saws, and two single saws by a steam engine of one hundred horse-power. Eighteen cords of wood are required per day for supplying the engine. Besides the timber on the island large quantities of pine are brought from Canada and sawed at the mill. Their fine timber is in quick demand at Buffalo, and in the vicinity, and their oak timber is exported to the Atlantic States. The frames of several large vessels of from 400 to 700 tons have been sent to the sea-board.

Accounts of the city of Buffalo, have within a few years been so much before the public, that I shall do nothing more than to express my admiration of the rapid growth; the increase of population and the rise in the value of property, of this Queen of the West. She is destined to still farther increase; and looking back upon her almost magical advances for the last few years, it is not easy to conjecture the limits to which her business may hereafter be carried. The land in the immediate neighborhood of Buffalo is not under cultivation: and compared with the demand and the intrinsic resources of the country, the meagre and inferior condition of her meat, vegetable, and fruit market is matter of just surprise. It seems impossible that it should long remain so; and the universal complaints on this subject, and the erection of large and handsome market houses will undoubtedly contribute to its improvement. The floating character of the population has undoubtedly retarded these improvements; the fever of speculation, which has been more violent in no place, has directed the attention to more exciting and engrossing objects, and the extraordinary and to those, who have not witnessed it, the almost incredible influx of strangers, emigrants, and adventurers has extended the demand beyond the present ability to supply.

A large tract of land in the immediate neighborhood, eighteen miles in length and seven in breadth, is held by the Seneca Indians. This great tract containing, 49,000 acres, as seen from the road which passes through it, embraces much land of the very best character. At present not much of the land is cultivated; and though there are some striking exceptions, the cultivation is in most cases very imperfect and slovenly. In some instances we saw tidy frame houses, neat enclosures, and the front yards ornamented with flowers. The Indians seem every where to be an indolent and improvident race, and unwilling to do more than procure a bare subsistance. Their wants in general are few, and their endurance under hardship and privation well known. Their appearance is in general squalid and disgusting. They are constantly to be seen in the streets of Buffalo, where they bring their baskets, their ornamental work, their reticules, moccasins, and slippers made of leather and inwrought with beads, to sell; and likewise berries and herbs. They stand about the streets, and stroll from one place to another gazing in stupid inanity. They are harmless and not giving to quarelling, but do not always understand, at least are not always wise observers of that great distinction in civil society, of *meum* and *tuum*. The men are a fine tall race, muscular and well proportioned; the women short, and in general extremely ugly; though in this matter they do not fall very far below the lowest class of Swiss and German women, who are to be seen constantly about the streets.

These Indians are entirely in the power of the State; and in my opinion ought to have been treated precisely like ignorant and helpless children. The State should maintain among them competent guardians and agents; and should compel them by fine, if it were practicable, and if other inducements failed, to clear, sow, build, enclose, and render their lands productive, and their condition comfortable, under a perfect assurance that the tenure of their improvements should be secure, and they should enjoy the fruits of their labor; instead of encouraging them, as is obviously too often the policy, in idleness, wretchedness, and vice, in order that they may become easily in the end, dispossessed of their territory or their race itself be extinguished. One great bar to the improvement of their condition arises undoubtedly from the custom prevailing among them, by which all the improvements made by any one, with all his personal property of every description, instead of giving at his death, by his will, to his squaw or children, in that event reverts to the tribe; and is scattered among the community. The great principle of accumulation, the right of property, and the power of controling and transmitting that property according to our pleasure at death, though principles violently assailed in these days of Agrarianism, and often in their operation productive of apparently unequal and unfortunate results, are notwithstanding, of the highest moment to the virtue of individuals, and the general welfare of the community.

There are some agricultural improvements in the vicinity of Buffalo, on the farm of Hiram Pratt, Esq., which are capital, and deserve particular notice. His farm lies on the shores of the Lake, and an extensive tract of bog, which was constantly filled with water from the Lake, has been drained; the waters in a great degree excluded, drains cut in various directions with perfect neatness and by skilful hands, the bushes and stumps extracted, and a meadow of a hundred acres extent, brought into grass; and presenting, I must admit, the most successful and beautiful improvement that my eye has ever rested upon. The process has occupied but a short time and, compared with the value and productiveness of the redeemed land, has been executed at small expense; and at an outlay, which will be immediately returned four fold. The growth of the second crop of grass upon it, which was all that the season permitted me to see, was most luxuriant; and the land is brought into condition for other crops to be cultivated with advantage. I have had only to regret, that Mr. Pratt's unusual engagements at the time, prevented his giving me that detailed account of the process and expenditures, which I should have been glad to lay before the readers of the New-York Farmer. The almost unsurpassed fertility of this deep alluvion, when the waters are taken from it, and the immediate vicinity of a quick market for all the produce, which can be gathered from it, would justify almost any expenditure for the redemption of this land. The process is still going on, and large adjoining tracts are to be cleared, drained, and subdued.

The trees on the uncleared lands bordering the turnpike, and from four to eight miles from Buffalo, in height and diameter surpass any thing that I ever witnessed. They are chiefly elm, white oak and white wood intermixed; and are of most singular beauty and magnificence. Similar remarks apply to many of the forests of this western world; and those of us, who have been accustomed only to the stunted growth

of more northern and less fertile soils, may be allowed to express our surprise, may I not add the enthusiasm of our admiration, coupled with deep humility, when standing among these mighty and untouched forests; and looking up to the spreading tops of these magnificent plants, these noble tenants of the soil, who have survived the storms and decays of centuries.

I am unwilling to quit Buffalo, without alluding to, I will not say the tide, but the torrent, the rushing flood of emigration, pouring itself westward. During a protracted stay of several weeks at Buffalo, it seemed "to cease not," day or night. Two, three, and sometimes five steamboats left Buffalo daily, for the upper shores of the Lake, beside other vessels; and all of them carrying their hundreds and hundreds. I have been often asked since my return, if these were not principally foreigners. I can only answers that of those whom I saw there was but a small sprinkling of Irish, and comparatively few Swiss and Germans. The great majority were New-Yorkers and New-England men, of the best class of yeomanry; respectable in manners and appearance, and of substantial condition and equipments. Such a population, especially migrating as is often the case in companies, and I may say villages, are not compelled to pass through the *chrysalis* state; but commence immediately with all the advantages and improvements of an advanced condition of society.

H. C.

From the Quarterly Journal of Agriculture.

STUDIES IN THE SCIENCE AND PRACTICE OF AGRICULTURE, AS CONNECTED WITH PHYSICS.

(Continued from page 168.)

Experiments on Feeding.—Some of the most instructive experiments upon the feeding of farm-stock with different materials, were made by an intelligent foreign agriculturist, M. Mathieu de Dombasles, and published in a work little known in this country, the *Annales de Roville.* The experiments usually made on this subject have been conducted upon the principle of continuing one species of food, such as hay or carrots, for a given time; but M. de Dombasles reflecting that it is neither natural nor agreeable to any animal to be confined for a length of time to the same species of food, adopted a different method. He separated into several groups the cattle on which he designed to experiment, and brought those in each group as nearly as possible to a given weight, by feeding them with an exactly weighed proportion of common articles of food, diversified to suit their taste. When he had proceeded so far, he then began to take away from their diversified food a known portion of one of them, such as lucern hay, (*luzerne seche,*) replacing it by some sort of root, such as carrots, gradually increased or diminished, so that each individual in the group came up to and sustained the weight it had stood at before the change. The comparison of the quantities thus ascertained by trial to be equivalent, gave the practical proportions of their nutritive properties, under the conditions thus associated.

The results thus obtained by M de Dombasles by trials with sheep, appeared to place carrots very far below the rank usually assigned to them as food for sheep by farmers on the Continent, and even as food for horses when substituted for grain. But it is important to remark, that M. de Dombasles gave the carrots in a raw state to his sheep, and consequently from their stomachs being unable in the process of digestion to cause the globules in the carrot containing the dextrine to burst, they derived little nutriment from a substance which is undoubtedly very nutritive when the dextrine is developed by boiling. The intelligent farmers in Belgium, who seem to be almost a century before other parts of Europe in improvement, never, it is said, give any roots to their live stock without boiling.

The digestion of food is in all animals partly a chemical and partly a mechanical process, and varies much in different animals, even when they feed on similar aliment, for example, the rabbit, the horse, and the game-cock, when fed upon oats or barley. The horse, and even the rabbit, when fed on oats, swallow many grains without crushing them with their teeth, and their stomachs not being endowed with the power of digesting solid uncrushed grain, it is voided whole, and so little changed as frequently to be capable of germinating. In the case of the game-cock, again, and all gallinaceous fowls which feed on grain, it is uniformly swallowed whole, their bills not being adapted for bruising it like the teeth of the horse, nor for shelling it like the linnets and sparrows. But the gizzard of these fowls has not only sufficient power to crush oats and barley, but even, as Spallanzani proved, to reduce glass to powder; yet with all this power, so very much greater than the digestive powers of the horse, poultry cannot, as will immediately be proved, completely extract the dextrine from grain, unless assisted to do so by artificial means, besides their powers of digestion. The celebrated M. Reaumur undertook a series of experiments on raw and on boiled grain in feeding, which though made long before the discovery of dextrine, strongly corroborate the views of MM. Raspail and Biot, the more so, indeed, from M. Reaumur's non-acquaintance with the principle.

The farmers in France who keep poultry, have long been in the habit of cooking the grain given to fowls which they intend to fatten, boiling it in water till it is soft enough to be easily bruised between the fingers, the heat causing it to swell till the mealy portion of the grain splits the chaffy envelope, and this they term bursting. It is therefore the popular opinion, that boiled grain is more nutritive and fattening than raw grain, an opinion founded, however, upon vague notions, which M. Reaumur endeavored to base upon precise calculation.

Boiling of Grain.—For this purpose M. Reaumur caused about four measures (each 1½ pint English or ⅘ths of a chopin Scotch) of each of the six common sorts of grain, to be boiled till they were well burst, (which may be fairly taken to mean that two-thirds of the dextrine was set free,) and he found that the increase of bulk in each sort was as under:—

Four measures of oats, after being boiled to bursting, filled	7	measures.
Four measures of barley, after being boiled to bursting, filled	10	...
Four measures of buckwheat or brank, after being boiled to bursting, filled	14	...
Four measures of maize, after being boiled to bursting, filled above	13	...
Four measures of wheat, after being boiled to bursting, filled little more than	10	...
Four measures of rye, after being boiled to bursting, filled nearly	15	...

Rice swells considerably more than any of the preceding, but was not measured.

In order to ascertain whether the boiling altered the preference of poultry for any of the particular sorts, M. Reaumur made experiments, varied in every possible way.—The fowls were furnished with two, three, four, five, and six different sorts, sometimes all the compartments of a feeding-box being filled with burst grain, each division differing from another, and sometimes each sort of grain filled two of the divisions, one having nothing but boiled, and another nothing but dry unboiled grain.

All that could be inferred from these repeated experiments was, that the greater number of fowls prefer boiled to raw grain, though there are many of them which show a preference to the raw grain on certain days, and no permanency could be discovered in the preference shown for any sort of burst grain. Some fowls, for instance, which one day preferred boiled wheat, would on other days, make choice of buckwheat or maize, oats or barley, and sometimes though more seldom, even of rye; but rye, either boiled or raw, is their least favorite sort of grain.

It follows as an important practical conclusion from such experiments, that we may make choice of the sort of grain which happens to be cheapest to feed poultry, without much if any disadvantage, always excepting rye, when other sorts are to be had on reasonable terms.

It required experiments of a different kind to prove whether there is any economy, or the contrary, in feeding poultry with boiled grain, and this was readily ascertained by finding first how much dry grain sufficed one or more fowls, and then boiling the same quantity and trying how much of that would in like manner be sufficient. The experiments which, for this purpose, M. Reaumur made with the different sorts of grain, were as follows:—

Rye.—Although, as we have seen, rye is very considerably increased in bulk by boiling, so far from being more sufficing, it becomes less so; for fowls will eat rather more of it when it is boiled than when it is raw

and dry. Seven hens and a cock, which consumed only three-fourths of a measure of dry rye in one day, ate in the same time three measures of the boiled grain. Consequently, as three measures of boiled rye are equivalent to four-fifths of dry, it would cost one-twentieth more to feed fowls with boiled than with dry rye, four-fifths being one-twentieth more than three-fourths.—The globules of rye are almost the same size, according to M. Raspail, with the globules of wheat.

Oats.—It appears, that although oats are increased by boiling nearly one-half, they are not, any more than rye, rendered more sufficing as food; for the fowls, which, in two days, would have eaten four measures of dry oats, consumed in the same time several measures of the boiled grain. Consequently, so far as fowls are concerned it is no saving to boil oats; though this does not prove that the same holds with regard to horses whose power of digestion are so inferior to those of fowls.

Buckwheat or Brank.—This grain is increased by boiling still more than oats, since four measures, when well boiled, swell to fourteen. Notwithstanding, there is little advantage obtained by boiling it for fowls, as they will consume the fourteen measures of the boiled grain nearly in the same time which the four measures of the dry grain would have sufficed them.

Maize or Indian Corn.—This grain is more profitable as food for poultry when boiled than when raw; for the fowls which would have eaten a measure and a quarter of dry maize, consumed only three measures of the boiled grain, and these three are not equivalent to one measure of dry maize. But it is worth remarking, that the fowls experimented upon continued only for two days able to get through three measures a day of the boiled maize. After this time, they either lost their appetite or came to dislike the food, since they could not then eat quite two measures of the boiled grain.—Now calculating that they had continued to eat even as much as three measures of boiled maize a day, there would be a saving of more than one-fifth; and if they were satisfied with two measures, the advantage would be much more considerable, inasmuch as this would not be equivalent to two-thirds of a measure of the dry grain. The saving in this case would be one-third and one-fifth, that is eight-fifteenths or more than one-half.

Barley.—This grain also was found upon trial to be much more economical when given to poultry boiled than raw. Fowls, which would have consumed two measures of the dry barley a day, got through only three measures daily of the boiled grain.—Now, as ten measures of boiled barley are produced from four measures of dry, three measures are, therefore, equivalent to no more than six-fifths of a measure of dry.—The expense consequently in dry barley, is to that of boiled as ten-fifths to six-fifths, that is, as ten to six or as five to three, showing a saving of two-fifths by feeding poultry with boiled instead of dry barley. This result is, no doubt, owing to the more effectual bursting of the grains of fecula, and setting free the dextrine contained in them.]

Wheat.—The results of the experiments on boiling grain, given above, show that wheat increases in bulk about the same as barley; but the experiments made on feeding poultry were considerably different in their results, the saving not being nearly so much with boiled wheat as with boiled barley; for the same fowls, which consumed three measures of boiled barley in one day ate three measures of boiled wheat. Now, 3 measures of boiled wheat are not equivalent to 2 measures of dry wheat, but only to a measure and a half of dry wheat, the quantity consumed in one day by the same fowls. But as a measure of boiled wheat is equivalent to no more than two-fifths of a measure of the dry grain, the three measures eaten in one day are equivalent only to six-fifths of dry wheat, and therefore the proportion of what they consumed of dry wheat was to what they consumed of the boiled, as fifteen-tenths to twelve-tenths, or as five to four; hence there is a saving of one-fifth by feeding with boiled wheat, as there is of two-fifths with boiled barley.

It is clearly proved, then, by these interesting experiments, that there is in most cases a considerable saving by feeding with boiled grain. It would be well if some intelligent gentleman would undertake similar experiments on feeding horses and cattle with boiled or steamed grain or meal. The advantage of feeding with crushed grain instead of giving it unbroken has been very satisfactorily proved and acted upon by Captain Cheyne (*Quarterly Journal of Agriculture*, iii. 1024, and iv. 378,) and recommended by Mr. Dick and others. The steaming of potatoes is well known to be advantageous in feeding both horses and cows, and more particularly in causing hens to lay, and in fattening pigs. Why should not the various sorts of grain, such as peas and beans, and meal, such as barley meal, given for similar purposes, not be advantageously increased in their nutritive properties by the same means? The expense of fuel, though it ought to be taken into the account, must be small in comparison with the advantage, at least in districts where coal or other fuel is reasonable in price. In large concerns, also, the expense of fuel would of course be proportionally less when compared with the saving in food.

Bread-making.—The most complete method hitherto discovered, for bursting all the globules of fecula, is the usual process of making bread, or, as chemists term it, *panification*. This arises from the presence in wheat flour of a substance termed gluten, associated with the globules of fecula, and constituting in the unbroken grain its cellular texture of frame-work. It would lead us too far from our present object to go into the history of this important substance minutely, but it may be necessary to state that the gluten may be procured by kneading and washing a piece of dough, made with wheat flour, in a stream of water, till all the globules of fecula are washed out. The gluten thus obtained is a greyish mass, elastic, like Indian rubber, when moist, and incapable of being dissolved in water. It is these two properties which render it so important in bread-making.

When a loaf is put into the hot oven, the steam and gases expand within it, and raise up the elastic gluten into bladder-like vesicles; and by this means expose the globules of fecula in the dough more uniformly to the heat than could be effected without such agency. In consequence of this they burst; and in a well baked loaf of bread not a single unburst globule of fecula can be found. On the Continent this is practically understood in the districts where they feed their horses chiefly on bread, as in most parts of Belgium, Prussia, and Switzerland. The bread thus given to horses is coarse, dark colored, and rather sour, from leaven being employed instead of yeast; but the partial fermentation caused by the leven must assist in bursting the globules, and setting free the dextrine from the action of the acid thus developed.

According to M. Raspail, and the fact has been stated by others, the more of other fecula we mix with good wheat flour, containing its due proportion of gluten, the less increase of weight does the bread acquire. For example, six pounds of flour will produce eight pounds of bread; but if three pounds of potato-starch be mixed with three pounds of wheat flour, instead of eight pounds of bread, there will only be six pounds. He explains the circumstance from the globules of fecula while unbroken not imbibing water, but being only moistened by its adhering to them; while the gluten sucks in water like a sponge, and the more it is kneaded the more water it will take up. The mixture, therefore, of other flour with that of wheat diminishes not only the weight but the nutritive materials in the bread.

Nutritive Principles of the Food of Plants.—It is stated in most elementary books, that the chief food of plants consists of carbonic acid gas diffused in water, together with potass and some other matters apparently not well understood. But a plain agriculturist not acquainted with science will very naturally ask how this is proved. By burning plants, indeed, he knows that charcoal (*carbon*) and potass may be produced; but in that case these are in a very different state from the one in which they exist in the growing plant. M. Lassaigne, the able Professor of Chemistry at Alfort, devised the ingenious experiment of analyzing the chemical constituents of seeds before and after germinating, and in this way arrived at one method of proof of the facts just stated; yet the plain farmer who might have witnessed such analysis would readily make a similar objection to it with that of procuring charcoal and potass by burning, namely, that it was an artificial process, and therefore calculated to change the state of the substances discovered.

In order to elucidate these points, confessedly difficult and obscure, M. Biot undertook the investigation, by applying his newly discovered and powerful test of the rotary polarization of light. Before giving any details of M. Biot's experiments, however, it may be well to state the views of M. Raspail respecting the imbibition and flow of the sap, these being rather novel as well as probable.

Circulation of the Sap.—All growing

vegetable textures are composed of cells, every where closed, containing a fluid which is in continual motion so long as th temperature is above 32° Fahr. The cell adhere to one another, or rather are fixe to one another by a sort of root or pedicl (*hilum,*) often too minute for observation ; and it is this, and the globules of the cell, which being lengthened out and expande in the progress of growth, give origin to new parts, or to the enlargement of old one.

The circulation of the fluid in the cells, originally discovered by Corti in the *Chara*, cannot be observed when the cells are opaque or the fluid transparent ; but an idea may be formed of it by filling a tube with spirits of wine, having some raspings of cork in it, and holding it in the hand, when the heat of the hand will cause a current to rise from the bottom up one side of the tube, and the cold at the top abstracting the heat from the particles as they rise, will cause an opposite current to descend on the other side. The difference of the vegetable circulation from this experimental one, consists in its being caused by a living principle, and not heat, though a certain temperature is indispensable. M. Raspail terms the operation of this principle in circulating the sap, *aspiration* (meaning by this something like suction or attraction,) and *expiration* (meaning something like expulsion or repulsion,) the sides of all the cells of growing plants alternately aspiring and expiring, or attracting and repelling fluids.

The membranes of plants, as well as the cells composing them, aspire and expire fluids ; and when these membranes form a tube with branches more or less composed of net-work or reticulations, the fluid forms one continuous current in every part of the tube.

The stems and branches of all plants are formed of cells, which, from having been originally globular, expand by growth; and by the pressure of other cells expanding around them, take a wedge like shape, the thin portion forming their point of attachment or pedicle (*hilum.*) The membranes thus formed may be conceived to sheath each other, the inner sheaths being inserted by their wedge-point (*hilum*) into the sides of the outer ones. These mutually sheathing membranes besides are traversed both across and lengthways by a net-work of vascular canals, and consequently the fluid transmitted by each wedge point must necessarily rise along the side next to the part above the wedge-point, falling down the opposite side, and again rising along the part below the wedge point, or the contrary. At the same time a portion of the fluid is transmitted to the wedge-point of the next enclosed sheathing membrane, where the circulation will take a similar direction.

The flow of the sap from the cut ends of a plant may thus be explained ; for on each cut surface there will be alternately one-half of a sheathing membrane, the fluid in which was rising up, and another half in which it was falling down.

The branches are always inserted by the wedge-points (*hila*) of their component sheathing membranes into the trunk or stem, and, consequently, the circulation of the fluid at the junction is the same as that just explained.

The sheathing membranes of the root, it must be remarked, do not terminate in the outer sheathing membrane or burso of the stem, but penetrate to one of the inner ones, and hence the rising sap, as yet not organized, is conveyed to an inner sheath.

The strong attractive power of the tips of the root fibres, through which alone the liquid food of plants is transmitted, may be seen when roots have been forced to grow between stones; for the tips will be found to adhere more or less firmly to the stones, while the other parts of the root are loose and free. In the same way particles of earth will generally be found adhering to the tips of the root-fibres, having been attracted by the suction or aspiration of the spongiole. (*Chimie Organique.* 811, &c.)

Changes in the Sap.—The preceding are the views of M. Raspail, which further researches may either confirm or refute. The following are a small portion of the interesting experiments and observations of M. Biot on the sap and its changes, and these, it may be remarked, wear more the air of fact, and look less theoretical, than Raspail's statements.

M. Biot first proposed to himself to ascertain, by means of circular polarization, the presence of the gummy or saccharine principles in the sap of trees, and to trace these principles as connected with the nourishment of the young buds in spring. Some of the facts which he discovered were very remarkable.

He pierced with holes, sloping slightly downwards, several species of trees, early in February,—the almond, the birch, the hornbeam, the maple, the ash, the lilac, the mulberry, the walnut, the elm, the poplar, the plane, the willow, the elder, the sycamore, the lime, and the vine,—fitting into each hole a dry reed, with the inserted extremity cut sloping, and scarcely penetrating deeper than the bark. The other extremity entered a small phial, suspended by a bit of wire, and luted with a mixture of oil and wax, immiscible in water. The flowing sap was collected in these phials, and when any evaporation of the water portion occurred from the temperature of the tree being higher than the air, it was condensed within the phial. He was not contented with experimenting on one tree of a species, but selected several of the same sort in various positions and exposures; and he also fixed on the same tree a considerable number of phials, at various heights from the ground.

Concluded in our next.

From the Maine Farmer.

USE OF THE ROLLER——RAISING POTATOES, &c.

Mr. Holmes :—The first knowledge I had of the roller I obtained from the N. E. Farmer, some years since. Being always desirous to try "new things," if they promise utility, and especially if they cost but little, I set about constructing one. As I could procure neither *stone* nor *cast iron*, and was too *poor* to do it, if they had been within my reach, I took a "junk" out of a hemlock log, about six feet in length—inserted gudgeons in the centre at each end, on which was hung a sort of frame, with a tongue like a sled.

With this machine, I went over my wheat ground, breaking every "lump," and sinking every small stone, and left the field in excellent order for the scythe.

Nor is this all the benefit derived from rolling. By pressing the soil closely round the grain, much more of it will vegetate than with the usual management—and in case of drouth, the ground will not "dry up" so quickly. As to making the ground heavy, (as some fear it will) I think it has about the same effect, with respect to that, as the hand of the housewife has, in being passed over the surface of the "brown loaf," before committing it to the oven.

Much has been said in the Farmer upon raising potatoes—each writer has rather a better method than *the others.* I am well satisfied with the method I have adopted, which is, to select a piece of grass ground, (the smoother the better) and cart on a large dressing of green barn manure, at my leisure. When ready to prepare for planting, I spread the manure evenly as possible, but no more in a day than I can turn under—turn the sod, flat and roll well immediately—then harrow length-wise of the furrows with a light harrow, till the interstices between them are filled—next mark off the rows with a small plough or chain, and plant on the surface with a covering of about two inches. I have practiced hilling lightly, but think I shall omit it altogether this year. I stir the ground well with the Cultivator.

Some of the advantages of this mode of culture I conceive to be the following :—The ground not being ploughed till late, the grass gets a good start, and being covered, together with the unfermented manure, ferments, and forms a *hot bed* which brings forward the crop surprisingly, and continues to afford nourishment in abundance, till it comes to maturity. The rolling prevents the furrows from being torn up by the harrow, and the filling of the crevices between the furrows prevents the possibility of any grass or weeds growing from the manure, and you have a clean field, if the soil is free from foul seeds, in fine order for a crop of wheat the next spring. I have pursued the same course with my corn for three years past, with the addition of a light top dressing of old manure, and I have never had better success.

Farming begins to *look up* in this section of the State, and with the bounty on wheat, and the present pinching scarcity of provisions, in view, I think, with the blessing of a bountiful Providence, we shall be better supplied for the future.

HORACE WILDER.

North Dixmont, April, 1837.

From the Maine Farmer.

"A CENT'S WORTH OF SAUCE SAVES A SHILLING'S WORTH OF MEAT."

Mr. Holmes :—I sometimes scribble a little for the Farmer, and I hope when you think that the public or farmers are not interested, you will oblige me by throwing my communications under your table.—

The Legislature have very wisely given an impulse to the raising of breadstuffs—the staff of life, so called—in Maine.—Though I hope considerable money will be taken from the Treasury for the premiums proposed—all can see that if more wheat be raised, more money will be saved in the State to replenish the Treasury—I am nevertheless convinced that Farmers do not pay attention enough to their Gardens, and the raising of beans, peas, and the various other varieties of sauce.

Does a cent's worth of sauce save a shilling's worth of meat? No doubt it does,—and I add that good sauce saves bread too. Beans, for instance, are a hearty sauce. One remarked to me recently, that "dear as beans are at present, they are the cheapest sauce in my family, for they save bread and meat too." I wish farmers would raise more of them, and attend more to the varieties. Sauce is also more healthy or wholesome than many things which we eat.

A Lover of Good Things.

Beet Sugar Manufactory.—We have published occasionally statements in relation to the Beet culture for the manufacture of Sugar; but seldom any thing in relation to the manufacture of the Sugar. We therefore now give a concise description of that process. We give it for the purpose of dispelling the idea, which many entertain, that the process of manufacture is a complicated and difficult one; when in truth it is about as simple as the manufacture of *Maple* Sugar.

From the Silk Culturist.

PROCESS OF MAKING BEET SUGAR.

The attention of the public having been some time drawn to the manufacture of sugar from the beet, and having repeatedly recommended its cultivation to farmers as a profitable crop, we have felt ourselves under an obligation to give them the details of the process by which it is extracted. We have, therefore, examined the best authorities on the suoject, and consulted several gentlemen of some practical knowledge and experience in the business, and the result of our investigation is that the process is altogether more simple and less expensive than has generally been supposed. In describing the various processes in the manufacture, we have carefully avoided the use of chemical terms, and substituted language which we hope will be understood by every reader.

There are several varieties of the beet which yield sugar; but the Silesian beet is recommended as the best and most productive. This beet will come to maturity in all parts of the United States, up to the 45th degree of latitude. The soil most congenial to its growth is a light sandy loam, of good depth, and if free from stones, the better. Probably no country in the world is better adapted to the growth of this root than the alluvial meadows on the Connecticut and other rivers of New England. The cultivation, however, need not be confined to valleys, as in most of the hill towns, lands may be found well adapted to its growth. The land is prepared for the seed by deep ploughing and pulverizing the surface. This is best accomplished by ploughing in the fall, and leaving the land in furrows through the winter. In the spring, the land should be cross ploughed and harrowed, and, if the soil be light, it will be prepared to receive the seed. The seed may be sown as early as the season will admit, broad-cast, or in drills; but ultimately the plants should be from 12 to 18 inches apart. They should be hoed and kept free of weeds—at the second hoeing they should be thinned out, and but one plant left in the hill—the surplus plants may be transplanted to vacant places in the field.

In the extraction of the sugar, the beets must first be cleaned by washing or scraping with a knife, and care be taken that all decayed parts be cut off. They must then be passed through the rasper and be reduced to a pulp—the finer they are rasped the better, as it facilitates expressing the juice. The pulp must then be put into cloth bags, and have the juice pressed out by a screw press. In France they use the hydraulic press; but a cider, or other press, will answer the purpose, and be attended with much less expense. As decomposition commences soon after the beet is out of the ground, and progresses rapidly, no time should be lost in converting them into sugar.

After the juice is expressed, and before it is converted into sugar, it must undergo four distinct and different processes. 1. Defecation. 2. Evaporation. 3. Clarification. 4. Concentration.

Defecation.

The composition of the beet juice does not differ essentially from that of the cane—it combines with the saccharine matter small quantities of malic or acetic acid, wax and mucilage, which must be extracted before evaporation is commenced. The first process, therefore, is to purify the juice, which must be done by neutralizing the acid, decomposing the wax, and coagulating the mucilage, and hence is called defecation. All this may be done by heating and mixing with it the milk of lime in about the proportion of 46 grains troy weight to the gallon. The milk of lime is prepared by slaking quicklime with hot water, and reducing it to the consistence of cream. The juice must be heated to about 160 degrees of Fahrenheit, and the milk of lime poured into it and thoroughly mixed by stirring with a stick. After it is intimately mixed, the stirring must be stopped, and the mixture suffered to rest for a short time. It must then be heated to the boiling point, which will throw the impurities upon the surface in the form of scum, when the boiling must be stopped. When the juice has become clear it must be drawn off from below, by means of a cock, or the scum must be skimmed off from the top—care being taken in either case to effect a complete separation.

Evaporation.

The next process in the manufacture is to dissipate the water, which is done by "boiling away," as it is commonly called, but in technical language, evaporation. If in the process of defecation an excess of lime has been used it should be extracted. This may be done by a mixture of sulphuric acid and water, in the proportion of one of the former to forty-four of the latter. This mixture, put in contact with the lime, causes an effervescence, by which the lime is thrown off, and the cessation of which is a sure evidence that the lime is neutralized. Some manufactures say that a small portion of lime should be allowed to remain, and others that the whole should be neutralized. As practical men differ on this point, we may safely conclude it is not very material.

The juice is boiled down till it is reduced to about one-fifth or one-sixth of its original quantity. For this purpose pans or kettles may be used; but it will be seen that those vessels which present the greatest surface to the fire, and give the least depth to the juice, will best facilitate evaporation. As the water evaporates, flaky substances will separate from the juice and collect in a white foam on the surface, which must be skimmed off as it appears. To promote their separation, the boiling is commenced with a moderate fire, which is subsequently increased as they disappear. Sometimes the white of eggs beaten, or a little blood, is added for the same purpose. During the boiling, the juice will rise in froth and flow over the top of the pan, unless prevented by occasionally throwing in a small quantity of some fatty substance. Butter is commonly used, but tallow, lard, &c. will answer the same purpose. It not only causes an immediate subsidence, but hastens evaporation.

Clarification.

After being defecated and evaporated, the juice is yet in a degree impure, and the object of the next process is to separate it from its remaining impurities, and hence is called clarification. This consists in filtering it through animal charcoal granulated [burnt bones broken to grains,] and is performed in the following manner. Tubs, or vats in the form of those used for leaching ashes are made of wood or metal, and furnished with a cock inserted near the bottom. The size of the vats is immaterial; but those of the following dimensions will be found most convenient—2 feet 8 inches deep—1 foot 8 inches diameter at the top, and 11 inches at the bottom. They may be four sided or round; but those made of staves and hooped with iron hoops we should think the cheapest, and on some accounts the best.

A strainer standing on legs, and covered with coarse cloth, must first be placed in the bottom of the vat and filled with the charcoal—about 100 pounds will be necessary for a vat of the above dimensions. The charcoal must then be covered with another strainer and cloth, and the vat filled with evaporated juice, or, as it is then called, sirup. After standing long enough to leach through the charcoal, the cock must be turned and the sirup be slowly drawn off, and the vat re-filled as fast as it is emptied. The charcoal must be changed twice a day; but it may be washed and reburnt, and, thus prepared, it will answer for another filtration. This may be repeated until it is consumed.

Concentration.

The next process is to solidify the sirup,

and hence is called concentration. To accomplish this it must be again evaporated until it is brought into a proper state for crystalization. As it is important that evaporation should cease as soon as it arrives at this point, Chaptal gives the following rules for ascertaining the fact. "1. Plunge a skimmer into the boiling sirup, and upon withdrawing it, pass the thumb of the right hand over its surface, mould the sirup which adheres to the thumb, between that and the fore-finger, till the temperature be the same as that of the skin—then separate the thumb and finger suddenly—if the boiling be not completed, no thread will be formed between the two; if there be a filament, the boiling is well advanced; and the process is completed as soon after as the filament breaks short, and the upper part, having the semi-transparency of horn, curls itself into a spiral. 2. The second mode of judging of the completion of the process is by observing the time when the sirup ceases to moisten the sides of the boiler, and then blowing forcibly into a skimmer which has just been immersed in it—if bubbles escape through the holes of the skimmer which ascend into the air in the same manner as soap bubbles do, the liquor is considered to be sufficiently boiled."

When the concentration arrives at this point, the sirup must be taken from the boiler and poured into large pans, for the purpose of cooling. The pans must be placed in the air, and the sirup occasionally stirred during the process of cooling, which will be completed in about two hours. On examination, the bottom and sides of the pan will be found covered with a thick bed of crystals, having but little consistence; on the surface of the sirup, a crust will also be formed. To promote crystalization, or, as it is more properly called, graining, a thin bed of brown sugar is sometimes put upon the bottom of the cooling pan, in order to make a nucleus about which the crystalized matter may gather.

After the sirup is cooled and crystalized, or grained, all that remains is to separate the sugar from the molasses, and it is fit for domestic consumption or market. To effect the separation, moulds, as they are called, must be prepared in the form of defecating vats, with the lower end drawn to a point, or so near a point as to leave a hole of three-fourths of an inch in diameter. These may be made of wood, metal or earthware, and their capacity may be regulated according to the convenience of the manufacturer. Those used in the sugar factories in France usually are large enough to contain five or six gallons. They are also used in the refining process. Before using them, if of wood, they must be soaked several hours in water, and dried a short time before they are filled with sirup. Thus prepared, and with a cork in the hole at the point, they must be filled, or nearly filled, with crystalized sirup, and secured in an upright position, over a pan or tub of sufficient size to receive the quanity of molasses it contains. After standing from 12 to 36 hours, according to circumstances, the cork is withdrawn and the molasses permitted to drain off. It will at first drain off rapidly; but soon cease to flow in any considerable quantity. To hasten its separation from the sugar, which takes place slowly, the mass must be pierced with an iron spear, by thrusting it into the hole at the point, which will give it vent and cause it to drain off. This operation must be repeated as often as is necessary, and until all the molasses is extracted.

After having remained long enough to have the molasses run off, the sugar is detached from the sides of the mould with a knife, the moulds are set on the floor in a reversed position and left for two or three hours—when, by lifting from the floor and giving it a shake, the loaf will separate from the mould by force of its own weight. The head of the loaf will retain a degree of moisture and a portion of molasses, and, consequently, should be cut off, and thrown into the juice intended or the next clarification. The molasses, also, when a sufficient quantity is on hand, should be again concentrated in order to obtain all the crystalizable sugar it contains. By the foregoing processes the beet is converted into brown sugar, the kind which is consumed in the largest quantities in most families. In the manufacture of loaf, or lump sugar, there is another process called "refining;" but being foreign to our present purpose, we omit it.

Correspondence of the Springfield Repub. and Jour

BOSTON, March 6.

The Faneul Hall Market attracts the attention of strangers. In many respects it has not its equal in the Union. It is 536 feet long, 50 feet wide, two stories high, and wholly built of granite. The centre of the building is wider and higher, being 74 feet by 55, with a dome. In the second story of the centre, is a spacious Hall, called Quincy Hall, in honor of John Quincy, Esq., who, as Mayor of Boston, contributed so much to the execution of the noble enterprise. The principle entrances are at the east and west ends—the west end fronting Faneuil Hall. This grand structure was commenced in August, 1824, and with the improvements on eaah side of the street opposite, was completed in about two years. The Market cost about $1,000,000. The greater part of the land on which the Market stands, as well as the beautiful row of stores on each side of the street opposite, has been reclaimed from the sea, by filling in with earth at different times. Many acres in other business parts of the city, have been made in the same way. The interior of the Market is divided into 128 stalls; 14 for mutton, lamb, veal and poultry; 2 for poultry and venison; 19 for pork, lamb, butter and poultry; 45 for beef; 4 for butter and cheese; 19 for vegetables, and 20 for fish. The second story of the Market is used as a depository for wood—and the Stores on South and North Market streets are built of corresponding architecture to the market. It is said there is no market in the Union which is so uniformly stocked in variety as this. Besides the usual assortments of meats and vegetables, here may be had all sorts of nuts and fruits. It is a sight for an epicure. One would think to see the great quantities of every kind of food, that there was no danger of famine. At the east end, on the outside, is a large open stall, where a thousand funny articles, books, songs, matches, &c. are offered for sale. This is brilliantly lighted in the evening. The market is most thronged of a Saturday evening. As I entered the west end, and looked down the long avenue of more than 500 feet, with a row of lamps on each side, it seemed like an endless gallery of "fat things," with a dense crowd of buyers the whole distance. As I forced my way through, I saw a number of poor men and women looking wishfully upon the fine beef, poultry, and butter, and seeming to say, I wish my money was equal to my desires.

FARMERS' WORK.

BACON.—About Christmas, if the weather be coldish, is a good time to kill. If the weather be very mild, you may wait a little longer; for the hog cannot be too fat. The day before killing, he should have no food. To kill a hog nicely, is so much of a business, that it is better to pay a shilling for having it done, than to stab and hack and tear the carcase about. There are two ways of going to work to make bacon; in the one you take off the hair by scalding.—This is the practice in most parts of England, and all over America. But the Hampshire way, and best way, is to burn the hair off. There is a great deal of difference in the consequences. The first method slackens the skin, opens all the pores of it, makes it loose and flabby by drawing out the roots of the hair. The second tightens the skin in every part, contracts all the sinews and the veins in the skin, and makes the flitch a solider thing, and the skin a better protection to the meat. The taste of the meat is very different from that of a scalded hog; and to this chiefly it was that the Hampshire bacon owed its reputation for its excellence. As the hair is to be burnt off, it must be dry, and care must be taken, that the hog be kept on dry litter of some sort, the day previous to killing. When killed he is laid upon a narrow bed of straw, not wider than his carcase, and only two or three inches thick. He is then covered all over thinly with straw, to which, according as the wind may be, the fire is put at one end.—As the straw burns, it burns the hair. It requires two or three coverings and burnings, and care is taken, that the skin be not, in any part, burnt or parched. When the hair is all burnt off close, the hog is scraped clean, but never touched with water. The upper side being finished, the hog is turned over, and the other side is treated in like manner. This work should always be done before day-light; for in the day-light, you cannot so nicely discover whether the hair be sufficiently burnt off. The light of the fire is weakened by that of the day. Besides, it makes the boys get up very early for once at any rate, and that is something; for boys always like a bonfire.—[Cobbett's Economy.]

From the New-York Cultivator.

DUTTON CORN.

NORTHAMPTON, Jan. 18th, 1837.

JUDGE BUEL—DEAR SIR—The following is a method of culture, and result of the seed corn purchased of you last autumn, which, if you think proper, you are at liberty to give a place in the Cultivator. The variety is the twelve rowed early Dutton, or Buel corn, and is the best with which I am acquainted, particularly for latitudes north of 40°, on account of its early maturity, which is, I should say, two weeks earlier than the common or eight rowed kind. Out of several acres of the latter, planted the last season, I had not a bushel of sound corn, it being destroyed by the early frosts, while the Dutton was ripened and harvested on the 20th September, and did not give more than two per cent. of soft corn. In the preparation of, the method of culture, &c., I pursued the course frequently recommended by you; but was, through the whole process, exceedingly annoyed in contending with old prejudices and practices of laborers and others, who often rebelled, and were disposed to place themselves conservators over me, in spite of all resistance on my part. If their prophecies were to prove true, my corn would have been seven times blasted. Grave doubts were expressed as to the advantage of the roller, and in the preparation of the seed, (*see Cultivator, vol.* 1, *p.* 37,) "whoever heard of rolling corn in *hot* tar? It will be scalded, ruined, and never come up." It *all* came up, however, and why? Because being of the early variety, it was well ripened, the preceding backward season, the reverse of which was much complained of in the common kind. Then, again, "it was too thick—depend upon it, sir, when you come to look for ears, you will find nothing but stalks; two feet and a half! four stalks in a hill! it is entirely too much—it will cover the ground and you will get nothing." As to smooth hoeing, or witho t hills, it was a thing they had "strong doubts about."—The cultivator, however, was allowed to be "a grand thing," and clean weeding presented no objections; here of course was a long respite, and I was allowed quietly to enjoy the pleasant anticipation of a good crop. It so happened that my corn was not hid in a corner, but grew in an open field, was subject to the inspection of many a passer by, and I was much gratified by the frequent remark,—"what a fine piece of corn?" But when the harvesting came, the objector says, "you have done wrong in cutting it up, it is better to top it," and again, "you are entirely too early, it will not harden." The fact is, however, it got thoroughly hard, and brighter or better corn I never saw; it was cut the 20th September, husked and weighed the 10th November. The piece of ground measured one acre and five and a half rods, and yielded eight thousand seven hundred and eleven and a half pounds, (which, at 75 lbs. the bushel, allowed by the agricultural society,) gave one hundred and twelve and a half bushels to the acre; also, four heavy two horse loads of well cured corn stalks, worth more than a ton of the best hay.

PREPARATION OF THE GROUND, MANURE, &c.

I have a fine lot, containing six acres, lying east, and in full view from my house, slightly undulating and gently sloping, on which two or three years ago, I commenced farming in miniature, on the rotation system, that I might judge of the comparative profit of good systematic culture, (by some laughed at as a book of knowledge,) compared with the slovenly and parsimonious habit, too often persevered in, and I am so far much pleased with the result; it speaks loud in favor of good husbandry. I am well satisfied, too, that you must feed your land if you would be fed yourself. This lot has for many years, (50 or more, for aught I know,) been undisturbed by the plough, from the erroneous opinion that good grass land should remain for the scythe only. The soil is mostly a warm sandy loam; some part of it, however, is low and wet; this I have overcome by thorough draining. (On this subject I may hereafter have something to say.)

I prepared by deep ploughing last fall, a part of the above lot, carted and spread upon it the 10th of May, 35 loads of long unfermented stable dung to the acre, making five heaps to the load, dropped at five yards distance each way; this, after being carefully spread, was passed over with a heavy roller, and afterwards well harrowed, planted the 15th of May, and ashed as it made its appearance above ground.

ESTIMATE OF EXPENCES, &c.

Dr.—		
To ploughing with two yoke of cattle, 1¼ days, at $3,		$4 50
Rolling and harrowing 1¼ days, single team, at $2,		3 00
Seed corn,		1 00
Preparing seed corn with tar, &c.		25
Planting two days, at $1,		2 00
Three hoeings, two days each, at $1.		6 00
Horse and man 1¼ days, with cultivator, $1 50,		2 25
Cutting and binding two days, at $1,		2 00
Picking and husking seven days, at $1,		7 00
38 loads manure, at $1,	$38 00	
Carting and spreading, at 25 cents,	9 50	
	$47 50	
Deduct two-thirds for the succeeding crops in the rotation,	31 61	
		15 89
20 bushels ashes, at 12½ cents,		2 50
Spreading 1 day, at $1,		1 00
Interest on land, valued at $150		9 00
		$56 39
Cr.—		
By 62½ bushels corn, at $1 50,		$93 75
50 bushels seed do. at $2,		100 00
2 do. soft do. at 50 cents,		1 00
4 loads stalks,		15 00
		$209 75
Deduct expenses,		56 39
Profit,		$153 36

I have not had experience enough to know which is the most preferable, to plough old sward land in the fall, and spread the manure on the surface the following spring, or to spread the manure in the spring before ploughing, and then turn it in. I think much may depend on the season, in the first practice; if the season should be dry, may not a good deal be dissipated by the winds? and again, if it should be wet, may not the roots reap a greater advantage, than if it lay beneath the turf? I will thank you for your views on the subject.*

Although I used my own teams, and hire my labor by the month, at 12 to $14, yet in consequence of rainy weather, broken days, &c., I think it but right to charge the fair price of labor by the day, both for man and team. In estimates of this kind, the labor is frequently charged per day at the average of the price per month, which makes quite a different result. The estimate of corn, at $1 50, may appear to many overrated, nevertheless, it is a fact, that corn of an inferior quality is selling with us at that price.

Yours, very respectfully,
H. G. BOWERS.

N. B. Since writing the above, it occurred to me that, although in the preparation of seed corn, tar is recommended chiefly, as a protection against birds, it may also have another very important effect, (thereby saving a replanting in consequence of wet weather,) in providing a coat, impervious to the superabundant water, until the sun shall, by its genial warmth, cause the germ to disengage itself from its confinement.

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* *Old* sward, for corn land, is best ploughed in the fall, and if long manure is at command, it may be buried in the operation. It will undergo but slight if any fermentation before ploughing, and the soil will imbibe what it gives off of nutriment. A clover lay is best ploughed early in May, having the manure previously spread. If, in the first, manure is not at command, we would recommend that the plough be set deep, and that the manure be buried in the spring, immediately preceding planting, by a superficial furrow, which shall leave the sod as much as possible undisturbed.—[Conductor.]

FALL OF FISHES FROM THE ATMOSPHERE IN INDIA; BY M. PRINSEP.—The fact that fishes fall from the atmosphere in the rainy season, however incredible it may appear, has been so frequently attested by credible witnesses that it can scarcely be doubted. As for myself, my credulity is compelled to yield to the discovery I made one day of a small fish, in my pluviometer, which was situated on an isolated pile of stones about five feet high, in my garden at Benares. A note from M. Cameron informs me that a rain of fishes occurred on the 19th of February, 1830, near Feridpoor. This fact was asserted before a magistrate, by many ocular witnesses, and it was their concurring testimony that towards noon of the above mentioned day, the sky was obscured, the rain commenced to fall, and shortly after, fishes of various sizes fell from the atmosphere. A large number were collected by several witnesses; some were found destitute of a head, and commenced to putrefy; others

were entire and fresh, but no one dared to eat them.—[Bib. Universelle, No. 3, Mars 1836.]

From the Journal of the Franklin Institute.

NEW PATENT LAW.

We have now the pleasure of presenting to the public the Law for the restoration of the Records and Models of the Patent Office, which will be found, also, to contain various provisions tending to secure the rights of bona fide inventors. For whatever there is of good in this law, and we think that there is much that is so, the public are indebted to the indefatigable exertions of the Hon. John Ruggles, of the Senate of the United States, who has devoted himself to this subject with equal zeal and success, from the inception of the bill, to its final signature by the President, at the moment before his term of office expired.

AN ACT,

In addition to the act to promote the progress of science and useful arts.

And be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any person who may be in possession of, or in any way interested in, any patent for an invention, discovery, or improvement, issued prior to the fifteenth day of December, in the year of our Lord one thousand eight hundred and thirty-six; or in an assignment of any patent, or interest therein, executed and recorded prior to the said fifteenth day of December, may, without charge, on presentation or transmission thereof to the Commissioner of Patents, have the same recorded anew in the Patent Office, together with the descriptions, specifications of claim, and drawings annexed or belonging to the same; and it shall be the duty of the Commissioner to cause the same, or any authenticated copy of the original record, specification, or drawing which he may obtain, to be transcribed and copied into books of record to be kept for that purpose; and wherever a drawing was not originally annexed to the patent and referred to in the specification, any drawing produced as a delineation of the invention, being verified by oath in such manner as the Commissioner shall require, may be transmitted and placed on file or copied as aforesaid, together with the certificate of the oath; or such drawings may be made in the office, under the direction of the Commissioner, in conformity with the specification. And it shall be the duty of the Commissioner to take such measures as may be advised and determined by the Board of Commissioners provided for in the fourth section of this act, to obtain the patents, specifications, and copies aforesaid, for the purpose of being so transcribed and recorded. And it shall be the duty of each of the several clerks of the Judicial Courts of the United States, to transmit, as soon as may be, to the Commissioner of the Patent Office, a statement of all the authenticated copies of patents, descriptions, specifications, and drawings of inventions and discoveries made and executed prior to the aforesaid fifteenth day of December, which may be found on the files of his office; and also to make out and transmit to said Commissioner, for record as aforesaid, a certified copy of every such patent, description, specification, or drawing, which shall be specially required by said Commissioner.

SEC. 2. *And be it further enacted*, That copies of such record and drawings, certified by the Commissioner, or, in his absence, by the chief clerk, shall be prima facie evidence of the particulars of the invention and of the patent granted therefor, in any judicial court of the United States, in all cases where copies of the original record or specifications and drawings would be evidence without proof of the loss of such originals; and no patent issued prior to the aforesaid fifteenth day of December shall after the first day of June next, be received in evidence in any of the said courts in behalf of the patentee or other person who shall be in possession of the same, unless it shall have been so recorded anew, and a drawing of the invention, if separate from the patent, verified as aforesaid, deposited in the Patent Office; nor shall any written assignment of any such patent, executed and recorded prior to the said fifteenth day of December, be received in evidence in any of the said courts in behalf of the assignee or other person in possession thereof, until it shall have been so recorded anew.

SEC. 3. *And be it further enacted*, That whenever it shall appear to the Commissioner that any patent was destroyed by the burning of the Patent Office building on the aforesaid fifteenth day of December, or was otherwise lost prior thereto, it shall be his duty, on application therefor by the patentee or other person interested therein, to issue a new patent for the same invention or discovery, bearing the date of the original patent, with his certificate thereon that it was made and issued pursuant to the provisions of the third section of this act, and shall enter the same of record: *Provided however*, That before such patent shall be issued, the applicant therefor shall deposite in the Patent Office a duplicate, as near as may be, of the original model, drawings, and description, with specification of the invention or discovery, verified by oath, as shall be required by the Commissioner; and such patent and copies of such drawings and descriptions, duly certified, shall be admissable as evidence in any judicial court of the United States and shall protect the rights of the patentee, his administrators, heirs, and assigns, to the extent only in which they would have been protected by the original patent and specification.

SEC. 4. *And be it further enacted*, That it shall be the duty of the Commissioner to procure a duplicate of such of the models destroyed by fire on the aforesaid fifteenth day of December, as were most valuable and interesting, and whose preservation would be important to the public; and such as would be necessary to facilitate the just discharge of the duties imposed by law on the Commissioner in issuing patents, and to protect the rights of the public and of patentees in patented inventions and improvements: *Provided*, That a duplicate of such models may be obtained at a reasonable expense: *And provided, also*, That the whole amount of expenditure for this purpose shall not exceed the sum of one hundred thousand dollars. And there shall be a temporary board of Commissioner, to be composed of the Commissioner of the Patent Office and two other persons to be appointed by the President, whose duty it shall be to consider and determine upon the best and most judicious mode of obtaining models of suitable construction; and, also, to consider and determine what models may be procured in pursuance of, and in accordance with, the provisions and limitations in this section contained. And said commissioners may make and establish all such regulations, terms, and conditions, not inconsistent with law, as in their opinion, may be proper and necessary to carry the provisions of this section into effect, according to its true intent.

SEC. 5. *And be it further enacted*, That whenever a patent shall be returned for correction and re-issue under the thirteenth section of the act to which this is additional, and the patentee shall desire several patents to be issued for distinct and separate parts of the thing patented, he shall first pay, in manner and in addition to the sum provided by that act, the sum of thirty dollars for each additional patent so to be issued: *Provided, however*, That no patent made prior to the aforesaid fifteenth day of December, shall be corrected and re-issued until a duplicate of the model and drawing of the thing as originally invented, verified by oath as shall be required by the Commissioner, shall be deposited in the Patent Office. Nor shall any addition of an improvement be made to any patent heretofore granted, nor any new patent be issued for an improvement made in any machine, manufacture, or process, to the original inventor, assignee, or possessor of a patent therefor, nor any disclaimer be admitted to record, until a duplicate model and drawing of the thing originally intended, verified as aforesaid, shall have been deposited in the Patent Office, if the Commissioner shall require the same; nor shall any patent be granted for an invention, improvement, or discovery, the model or drawing of which shall have been lost, until another model and drawing, if required by the Commissioner, shall, in like manner, be deposited in the Patent Office; and in all such cases, as well as in those which may arise under the third section of this act, the question of compensation for such models and drawings, shall be subject to the judgment and decision of the Commissioners provided for in the fourth section, under the same limitations and restrictions, as are therein prescribed.

SEC. 6. *And be it further enacted*, That any patent hereafter to be issued, may be made and issued to the assignee or assignees of the inventor or discoverer, the assignment thereof being first entered of record, and the application therefor being duly

made, and the specification duly sworn to by the inventor. And in all cases hereafter, the applicant for a patent shall be held to furnish duplicate drawings, whenever the case admits of drawings, one of which to be deposited in the office, and the other to be annexed to the patent, and considered a part of the specification.

Sec. 7. *And be it further enacted*, That, whenever any patentee shall have, through inadvertence, accident or mistake, made his specification of claim too broad, claiming more than that of which he was the original or first inventor, some material and substantial part of the thing patented being truly and justly his own, any such patentee, his administrators, executors, and assigns, whether of the whole or of a sectional interest therein, may make disclaimer of such parts of the thing patented, as the disclaimant shall not claim to hold by virtue of the patent or assignment, stating therein the extent of his interest in such patent; which disclaimer shall be in writing, attested by one or more witnesses, and recorded in the Patent Office, on payment by the person disclaiming, in manner as other patent duties are required by law to be paid, of the sum of ten dollars. And such disclaimer shall thereafter be taken and considered as a part of the original specification, to the extent of the interest which shall be possessed in the patent or right secured thereby, by the disclaimant, and by those claiming by or under him subsequent to the record thereof. But no such disclaimer shall affect any action pending at the time of its being filed, except so far as may relate to the question of unreasonable neglect or delay in filing the same.

Sec. 8. *And be it further enacted*, That, whenever application shall be made to the Commissioner for any addition of a newly discovered improvement to be made to an existing patent, or whenever a patent shall be returned for correction and re-issue, the specification of claim annexed to every such patent shall be subject to revision and restriction, in the same manner as are original applications for patents; the Commissioner shall not add any such improvement to the patent in one case, nor grant the reissue in the other case, until the applicant shall have entered a disclaimer, or altered his specification of claim in accordance with the decision of the Commissioner; and in all such cases, the applicant if dissatisfied with such decision, shall have the same remedy and be entitled to the benefit of the same privileges and proceedings as are provided applicat onsoriginal case of by law in the for patents.

Sec. 9. *And be it farther enacted*, Any thing in the fifteenth section of the act of which this is additional to the contrary notwithstanding, That, whenever by mistake, accident, or inadvertence, and without any wilful default or intent to defraud or mislead the public, any patentee shall have in his specification claimed to be the original and first inventor or discoverer of any material or substantial part of the thing patented, of which he was not the first and original inventor, and shall have no legal or just right to claim the same, in every such case the patent shall be deemed good and valid for so much of the invention or discovery as shall be truly and bona fide his own, provided it shall be a material and substantial part of the thing patented, and be definitely distinguishable from the other parts so claimed without right as aforesaid. And every such patentee, his executors, administrators, and assigns, whether of a whole or a sectional interest therein, shall be entitled to maintain a suit at law or in equity on such patent for any infringement of such part of the invention or discovery as shall be bona fide his own as aforesaid, notwithstanding the specification may embrace more than he shall have any legal right to claim. But, in every such case in which a judgment or verdict shall be rendered for the plaintiff, he shall not be entitled to recover costs against the defendant, unless he shall have entered at the Patent Office, prior to the commencement of the suit, a disclaimer of all that part of the thing patented which was so claimed without right: *Provided, however*, That no person bringing any such suit shall be entitled to the benefits of the provisions contained in this section who shall have unreasonably neglected or delayed to enter at the Patent Office, a disclaimer as aforesaid.

Sec. 10. *And be it further enacted*, That the Commissioner is hereby authorized and empowered to appoint agents in not exceeding twenty of the principal cities or towns in the United States, as may best accommodate the different sections of the country, for the purpose of receiving and forwarding to the Patent Office all such models, specimens of ingredients and manufactures, as shall be intended to be patented or deposited therein, the transportation of the same to be chargeable to the patent fund.

Sec. 11. *And be it further enacted*, That, instead of one examining clerk, as provided by the second section of the act to which this is additional, there shall be appointed, in manner therein provided, two examining clerks, each to receive an annual salary of fifteen hundred dollars; and also an additional copying clerk, at an annual salary of eight hundred dollars. And the Commissioner is also authorized to employ, from time to time, as many temporary clerks as may be necessary to execute the copying and draughting required by the first section of this act, and to examine and compare the records with the originals, who shall receive not exceeding seven cents for every page of one hundred words, and for drawings, and comparison of records with originals, such reasonable compensation as shall be agreed upon or prescribed by the Commissioner.

Sec. 12. *And be it further enacted*, That, whenever the application of any foreigner for a patent shall be rejected and withdrawn for want of novelty in the invention, pursuant to the seventh section of the act to which this is additional, the certificate thereof of the Commissioner shall be a sufficient warrant to the Treasurer to pay back to such applicant two-thirds of the duty he shall have paid into the Treasury on account of such application.

Sec. 13. *And be it further enacted*, That, in all cases in which an oath is required by this act, or by the act to which this is additional, if the person of whom it is required shall be conscientiously scrupulous of taking an oath, affirmation may be substituted therefor.

Sec. 14. *And be it further enacted*, That all monies paid into the Treasury of the United States for patents and for fees for copies furnished by the Superintendent of the Patent Office prior to the passage of the act to which this is additional, shall be carried to the credit of the patent fund created by said act; and the monies constituting said fund shall be, and the same are hereby, appropriated for the payment of the salaries of the officers and clerks provided for by said act, and all other expenses of the Patent Office, including all the expenditures provided for by this act; and also, for such other puposes as are or may be hereafter specially provided for by law. And the Commissioner is hereby authorized to draw upon said fund, from time to time, for such sums as shall be necessary to carry into effect the provisions of this act, governed, however, by the several limitations herein contained. And it shall be his duty to lay before Congress, in the month of January, annually, a detailed statement of the expenditures and payments by him made from said fund.

And it shall also be his duty to lay before Congress, in the month of January, annually, a list of all patents which shall have been granted during the preceding year, designating, under proper heads, the subjects of such patents, and furnishing an alphabetical list of the patentees, with their places of residence; and he shall also furnish a list of all patents which shall have become public property during the same period; together with such other information of the state and condition of the Patent Office, as may be useful to Congress or to the Public.

Approved, March 3d. 1837.

From the Journal of the Franklin Institute.

A MODE OF ANALYSING GERMAN SILVER.

BY JAS. C. BOOTH.

As the employment of this interesting compound is daily becoming more general, it becomes a point of some importance to the manufacturer to ascertain with some accuracy the composition of those kinds in the market, which are adjudged to possess superior qualities. For this purpose I have contrived a method of analysing them, which may be successfully practised by any one who possesses a little chemical knowledge. A small piece of about 20 grains is dissolved in nitro-muriatic acid with the assistance of a gentle heat, by which means the metals will be converted into chlorides. If the solution be filtered through a small paper-filter, and a white powder remain after washing with water, it is the chloride of silver, the presence of which metal in the compound is accidental and scarcely appreciable. The acidulated solution is then treated by sulphuretted hydrogen, which separates copper and a little arsenic. The sulphuret of copper is collected on a filter, treated with nitric acid in a gentle

heat, till the sulphur appears whitish, then filtered, brought to boiling, precipitated with caustic potassa, filtered and weighed. 100 parts of this precipitate contains 79.83 of metallic copper. To the solution after filtering off the sulphuret of copper, a little nitric acid is added, and the whole heated in order to convert the protroxide into the peroxide of iron. Muriate of Ammonia is then added to the same and a small excess of ammonia, which precipitates only the peroxide of iron. This may be collected on a filter and weighed, 100 parts of it contain 69.34 of metallic iron. The solution is now to be treated with carbonate of soda and evaporated to dryness; the dry mass is treated with hot water, and the residue washed and dried. This powder, consisting of carbonic of zinc and nickel, is mixed with half its weight of saltpetre and ignited until the whole is nearly dry. It is transferred to a filter after being powdered in a small mortar, and is then washed two or three times with pure, but dilute, nitric acid, which dissolves the oxide of zinc, and leaves the *peroxide* of nickel. To the zinc solution carbonate of soda is added, the whole evaporated to dryness, treated with hot water, and the remainder after being dried and ignited is weighed, 100 parts contain 80.13 metallic zinc. The peroxide of nickel is dissolved in hydro-chloric acid, precipitated by caustic potassa, filtered off and weighed, 100 parts of it contain 78.71 metallic nickel.

The separation of nickel and zinc is ever attended with difficulty and some uncertainty, but it is rendered much more simple by the method which I propose, and which is not more inaccurate than others in use. Before weighing any of the above oxides, it is decidedly preferable to burn the filter after shaking off as much of the substance as possible into a platinum crucible, to add the ashes, and then substract their weight from that of the oxide.

From the American Journal of Science and Arts, for April, 1837.

NOTICE OF THE ELECTRO-MAGNETIC MACHINE OF MR. THOMAS DAVENPORT, OF BRANDON, NEAR RUTLAND VERMONT.

Many years have passed since motion was first produced by galvanic power. The dry columns of De Luc and Zamboni caused the vibration of delicate pendulums and the ringing of small bells, for long periods of time, even several years without intermission.

In 1819–20, Prof. Oersted, of Copenhagen, discovered, that magnetism was evolved between the poles of a galvanic battery. Prof. Sweigger, of Halle, Germany, by his galvanic multiplier, succeeded in rendering the power manifest, when the galvanic battery was nothing more than two small wires, one of copper and the other of zinc, immersed in as much acidulated water as was contained in a wine glass. The power thus evolved was made to pass through many convolutions of insulated wire, and was thus augmented so as to deflect the magnetic needle sometimes even 90°. Prof. Moll, of Utretcht, by winding insulated wire around soft iron, imparted to it prodigious magnetic power, so that a horse shoe bar, thus provided, and connected with a galvanic battery, would lift over one hundred pounds. About the same time, Mr. Joseph Henry, of Albany, now Prof. Henry, of Princeton College, by a new method of winding the wire, obtained an almost incredible magnetic force, lifting six or seven hundred pounds, with a pint or two of liquid and a battery of corresponding size; nor did he desist, until, a short time after, he lifted thousands of pounds, by a battery of larger size, but still very small, (1830.)

This gentleman was not slow to apply his skill to the generation of motion, and a successful attempt of his is recorded in this Journal, Vol. xx. p. 340. A power was thus applied to the movement of a machine, by a beam suspended in the centre, which performed regular vibrations in the manner of a beam of a steam-engine. This is the original application from which have sprung, or at least to which have succeeded, several similar attempts, both in this country and in Europe. A galvanic machine was reported to the British Association in 1835, by Mr. McGauly, of Ireland, and he has renewed his statements of successful experiments at the late meeting at Bristol. Mr. Sturgeon, of Woolwich, England, also reports a galvanic machine as being in use on his premises for pumping water, and for other mechanical purposes.*

But, I believe that Mr. Davenport, named at the head of this notice, has been more successful than any other person in the discovery† of a galvanic machine of great simplicity and efficiency. During the last two or three years, much has been said of this discovery in the newspapers, and it is probable, that in a future number of this Journal, drawings, and an accurate description of the machine may be given. Having been recently invited to examine a working model, in two varieties of form, and to report the result, I shall now attempt nothing more than a general description, such as may render intelligible the account I am to give.

1. *The Rotary Machine, composed of revolving electro-magnets, with fixed permanent magnets.*

This machine was brought to New-Haven March 16, 1837, by Mr. Israel Slade, of Troy, N. Y., and by him set in motion for my examination. The moving part is composed of two iron bars placed horizontally, and crossing each other at right angles. They are both five and a half inches long, and they are terminated at each end by a segment of a circle made of soft iron; these segments are each three incher long in the chord line, and their position, as they are suspended upon the ends of the iron bars, is horizontal.

The iron cross is sustained by a vertical axis, standing with its pivot in a socket, and admitting of easy rotation. The iron cross bars are wound with copper wire, covered by cotton, and they are made to form, at pleasure, a proper connexion with a small circular battery, made of concentric cylinders of copper and zinc, which can be immersed in a quart of acidulated water. Two semicircles of strongly magnetized steel form an entire circle, interrupted only at the two opposite poles, and within this circle, which lies horizontally, the galvanized iron cross moves in such a manner that its iron segments revolve parallel and very near to the magnetic circle, and in the same plane. Its axis at its upper end, is fitted by a horizontal cog-wheel to another and larger vertical wheel, to whose horizontal axis, weight is attached and raised by the winding of a rope. As soon as the small battery, destined to generate the power, is properly connected with the machine, and duly excited by diluted acid, the motion begins, by the horizontal movement of the iron cross, with its circular segments of flangers. By the galvanic connection, these crosses and their connected segments are magnetized, acquiring north and south polarity at their opposite ends, and being thus subjected to the attracting and repelling force of the circular fixed magnets, a rapid horizontal movement is produced, at the rate of two hundred to three hundred revolutions in a minute, when the small battery was used, and over six hundred with a calorimotor of large size. The rope was wound up with a weight of fourteen pounds attached, and twenty-eight pounds were lifted from the floor. The movement is instantly stopped by breaking the connexion with the battery, and then reversed by simply interchanging the connexion of the wires of the battery with those of the machine, when it becomes equally rapid in the opposite direction.

The machine, as a philosophical instrument, operates with beautiful and surprising effect, and no reason can be discovered why the motion may not be indefinitely continued. It is easy to cause a very gradual mov of the impaired or exhausted acid liquid from, and of fresh acidulated water into, the receptacle of the battery, and whenever the metal of the latter is too much corroded to be any longer efficient, another battery may be instantly substituted, and that even before the connexion of the old battery is broken. As to the energy of the power, it becomes at once a most interesting inquiry, whether it admits of indefinite increase? To this inquiry it may be replied, that provided the magnetism of both the revolving cross and of the fixed circle can be indefinitely increased, then no reason appears why the energy of the power cannot also be indefinitely increased. Now, as magnets of the common kind, usually called permanent magnets, find their limits within, at most, the power of lifting a few hundred pounds, it is obvious that the revolving galvanic magnet must, in its efficiency, be limited, by its relation to the fixed magnet. But it is an important fact, discovered by experience, that the latter is soon impaired in its power by the influence of the revolving galvanic magnet, which is easily made to surpass it in energy, and thus, as it were, to overpower it. It is obvious, therefore, that the fixed magnet, as well as the revolving, ought to be magnetized

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* Sturgeon's Annals of Electricity, Magnetism, &c. No. 1. Vol. 1. October, 1836.

† Mr. Davenport appears to have been strictly the inventor of a method of applying galvanism to produce rotary motion.

by galvanism, and then there is every reason to believe that the relative equality of the two, and of course their relative energy, may be permanently supported, and even carried to an extent much greater than has been hitherto attained.

2. *Rotating Machine, composed entirely of electro-magnets, both in its fixed and revolving members.*

A machine of this construction has been, this day, March 29, 1837, exhibited to me by Mr. Thomas Davenport himself, who came from New-York to New-Haven for that purpose.

It is the same machine that has been already described, except that the exterior fixed circle is now composed entirely of electro-magnets.

The entire apparatus is therefore constructed of soft unmagnetic iron, which being properly wound with insulated copper wire, is magnetized in an instant, by the power of a very small battery.

The machine is indeed the identical one used before, except that the exterior circle of permanent magnets is removed and in its place is arranged a circle of soft iron, divided into two portions to form the poles.

These semicircles are made of hoop iron, one inch in width, and one-eighth of an inch in thickness. They are wound with copper wire insulated by cotton—covering about ten inches in length on each semicircle and returning upon itself, by a double winding, so as to form two layers of wire, making on both semicircles about one thousand five hundred inches.

The iron was not wound over the entire length, of one of the steel semicircles; but both ends were left projecting, and being turned inward, were made to conform to the bend of the other part, as in the annexed figure, which is intended to represent one of

them; each end that is turned inward and not wound is about one-third of the length of the semicircle. These semicircles being thus fitted up, so as to become, at pleasure, galvanic magnets, were placed in the same machine that has been already described, and occupied the same place that the permanent steel magnets did before. The conducting wires were so arranged, that the same current that charged the magnets of the motive wheel, charged the stationary ones, placed around it, only one battery being used. It should be observed, that the stationary galvanic magnets thus substituted for the permanent steel ones, were only about half the weight of the steel magnets. This modification of the galvanic magnet, is not of course the best form for efficiency; this was used merely to try the principle, and this construction may be superseded by a different and more efficient one. But with this arrangement, and notwithstanding the imperfection of the mechanism of the machine—when the battery, requiring about one quart of diluted acid to immerse it, was attached, it lifted 16 lbs., very rapidly, and when the weight was removed, it performed more than 600 evolutions per minute.

So sensible was the machine to the magnetic power, that the immersion of the battery one inch into the acidulated water, was sufficient to give it rapid motion, which attained its maximum, when the battery was entirely immersed. It appeared to me that the machine had more energy with the electro-magnets, than with those that were permanent, for with the smallest battery, whose diameter was three inches and a half; its height five inches and a half, and the number of concentric cylinders three of copper and three of zinc, the instrument manifested as great power as it had done with the largest batteries, and even with a large calorimotor, when it was used with a permanent instead of a galvanic magnet. With the small battery and with none but electro or galvanic magnets, it revolved with so much energy as to produce a brisk breeze, and powerfully to shake a large table on which the apparatus stood.

Although the magnetization of both the stationary and revolving magnets was imparted by one and the same battery, the magnetic power was not immediately destroyed by breaking the connexion between the battery and the stationary magnet; for, when this was done, the machine still performed its revolutions with great, although diminished energy; in practice this might be important, as it would give time to make changes in the apparatus, without stopping the movement of the machine.

It has been stated by Dr. Ritchie, in a late number* of the London and Edinb. Phil. Magazine, that electro-magnets do not attract at so great a distance as permanent ones, and therefore are not well adapted for producing motion. On this point Mr. Davenport made the following experiment, of which I was not a witness, but to which I give full credit, as it was reported to me by Mr. Slade, in a letter dated New-York, March 24, 1837.

Mr. Davenport suspended a piece of soft iron with a long piece of twine and brought one pole of a highly charged steel magnet within the attracting distance, that is, the distance at which the iron was attracted to the magnet; by measurement, it was found that the steel magnet attracted the iron one inch and one-fourth. A galvanic magnet was next used of the same lifting power, and consequently of much less weight; the attracting distance of this magnet was found to be one inch and three-fourths, showing a material gain in favor of the galvanic magnet.—Mr. Slade inquires, "has Mr. Ritchie's magnet been so constructed as to give a favorable trial to this principle?"† Mr. Davenport informs me that each increase in the number of wires has been attended with an increase of power.

Conclusions.

1. It appears then, from the facts stated above, that electro-magnetism is quite adequate to the generation of rotary motion.

2. That it is not necessary to employ permanent magnets in any part of the construction, and that electro-magnets are far preferable, not only for the moving but for the stationary parts of the machine.

3. That the power generated by electro-magnetism may be indefinitely prolonged, since, for exhausted acids, and corroded metals, fresh acids and batteries, kept always in readiness, may be substituted, even without stopping the movement.

4. That the power may be increased beyond any limit hitherto attained, and probably beyond any which can be *with certainty* assigned,—since, by inceasing all the members of the apparatus, due referrence being had to the relative proportionate weight, size, and form of the fixed and moveable parts—to the length of the insulated wires and the manner of winding them—and to the proper size and construction of the battery, as well as to the nature and strength of the acid or other exciting agent, and the manner of connecting the battery with the machine, it would appear certain, that the power must be increased in some ratio which experience must ascertain.

5. As electro-magnetism has been experimentally proved to be sufficient to raise and sustain several thousands of pounds, no reason can be discovered why, when the acting surfaces are, by skillful mechanism, brought as near as possible, without contact, the continued exertion of the power should not generate a continued rotary movement, of a degree of energy inferior indeed to that exerted in actual contact, but still nearly approximating to it.

6. As the power can be generated cheaply and certainly—as it can be continued indefinitely, as it has been very greatly increased by very simple means—as we have no knowledge of its limit, and may therefore presume on an indefinite augmentation of its energy, it is much to be desired, that the investigation should be prosecuted with zeal, *aided by correct scientific knowledge*, by *mechanical skill*, and by *ample funds*. It may therefore be reasonably hoped, that science and art, the handmaids of discovery, will both receive from this interesting research, a liberal reward.

Science has thus, most unexpectedly, placed in our hands a new power of great but unknown energy.

It does not evoke the winds from their caverns; nor give wings to water by the urgency of heat; nor drive to exhaustion the muscular power of animals; nor operate by complicated mechanism; nor accumulate hydraulic force by damming the vexed torrents; nor summon any other form of gravitating force; but, by the simplest means—the mere contact of metallic surfaces of small extent, with feeble chemical agents, a power every where diffused through nature, but generally concealed from our senses, is mysteriously evolved, and by circulation in insulated wires, it is still more mysteriously augmented, a thousand and a thousand fold, until it breaks forth with incredible energy: there is no appreciable interval between its first evolution and its full maturity, and the infant starts up a giant.

Nothing since the discovery of gravitation and of the structure of the celestial systems, is so wonderful as the power evolved by galvanism; whether we contemplate it in the muscular convulsions of animals, the chemical decompositions, the solar brightness of

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* January, 1837.

† This question I am not able to answer, as I have not seen any account of the apparatus or of the experiment, but only of the result.

the galvanic light, the dissipating consuming heat, and, more than all, in the magnetic energy, which leaves far behind all previous artificial accumulations of this power, and reveals, as there is full reason to believe, the grand secret of terrestrial magnetism itself.

B. S.

New-Haven, March 31, 1837.

Claim of Thomas Davenport.

In the words of the patent, taken out, this invention "consists in applying magnetic and electro-magnetic power as a moving principle for machinery, in the manner described, or in any other substantially the same in principle."

"Mr. Davenport first saw a galvanic magnet in December, 1833, and from the wonderful effects produced by suspending a magnet of 150 lbs. from a small galvanic battery, he immediately inferred, without any knowledge of the theory or the experiments of others, that he could propel machinery by galvanic magnetism. He purchased the magnet and produced his first rotary motion in July, 1834. In July, 1835, he submitted his machine to Prof. Henry, of Princeton, New-Jersey, also without any knowledge of Prof. Henry's experiments in producing a vibratory motion. From this gentleman he received a certificate, testifying to the originality and importance of the invention."

Mr. Davenport is, by occupation, a blacksmith, with only a common education, but with uncommon intelligence; his age about thirty-five. Mr. Ransom Cook, of Saratoga Springs, is associated with Mr. Davenport, and has rendered essential service by the improvements he has made in the machine, and by his assistance in bringing the subject before the public in the most effectual way. Arrangements have been made to take out the patent in Europe.

P. S. The proprietors are constructing a machine of seven inches in diameter, and also one of two feet in diameter. Galvanic magnets will be used as the moving and stationary magnets of each.

From the Farmers' Register.

ACCOUNT OF THE GREENSVILLE AND ROANOKE RAILWAY.

December 1st, 1836.

As the Greensville and Roanoke Railroad is about to go into operation, a concise account of its origin, location, construction, and probable revenue, may not be uninteresting to at least a portion of your readers.

To secure the trade, and bring to its own market the produce of the great and fertile valley of the Roanoke, has always been considered a matter of the greatest importance by the town of Petersburg. For this purpose, (among the first in this country, though still a new work,) was the Petersburg and Roanoke railway constructed—an improvement which has far surpassed the expectations of its warmest advocates. Blakely, on the Roanoke, and nearly four miles below the falls, was selected as the point of termination of this road. This work, however, had scarcely gone into operation, when the Portsmouth and Roanoke Railroad was projected, to connect the towns of Portsmouth and Weldon, (the latter place on the Roanoke, four miles above Blakely) the object of which was to divert this same trade to Portsmouth and Norfolk. The Petersburg interest, thus in danger of being cut off from the trade of the upper Roanoke, saw at once the necessity of a branch from their road, to some point on that river still higher up than Weldon; and for this purpose, a joint charter was obtained from the legislatures of Virginia and North Carolina, for a railroad from some point in the vicinity of Hicksford, in Greensville county, to Wilkins' ferry, (now Gaston,) fifteen miles above Weldon.

During the summer of the past year, the surveys were commenced, vigourously prosecuted, the location finally determined, and the work let for construction in the latter part of September.

The line of the Greensville and Roanoke Railroad leaves the most western point of the Petersburg road, about three miles south of Belfield, and after crossing Fontaine's creek, about two miles from its commencement, keeps on the ridge between that and Beaver creek, till it reaches the summit between the waters of the Meherrin and those of the Roanoke. The valley of a ravine, emptying into the latter, is there made use of in the descent to the Roanoke. This location, the best that could possibly be obtained, is, on the whole, favorable; but yet, not as much so as the public might be led to suppose, from the term *ridge location*, in consequence of the sinuosities of this ridge at certain points.

This road is peculiarly adapted to the use of locomotive power, the curves being all short, and very gentle, and the grades easy, no where exceeding a rise of sixteen feet to the mile in the direction of the heavy trade, or of thirty-two feet to the mile in the opposite direction, except in the short descent to the Roanoke, of which more hereafter.

The following table will give the reader some idea of the curves, and the tangents, or straight lines, connecting them.

No. 1, is the junction of the Petersburg and Greensville roads—No. 17, is on the bank of the Roanoke; the other numbers are merely used to designate points of curve, and the terms *right* and *left*, are used on the supposition that the traveller is leaving Petersburg.

From No. 1—curve to right —radius 2865 feet,	3,000	feet to
No. 2—straight,	7,800	feet
" 3—curve to left— radius 5730 feet,	1,200	"
No. 4—straight,	19,200	"
No. 5—curve to right —radius 5730 feet,	800	"
No. 6—straight,	7,400	"
No. 7—curve to left —radius 5730 feet,	800	"
No. 8—straight,	4,000	"
No. 9—curve to left —radius 5730 feet,	3,200	"
No. 10—straight,	6,900	"
No. 11—curve to right —radius 5730 feet,	500	"
No. 12—straight,	18,300	"
No. 13—curve to right —radius 2865 feet,	2,100	"
No. 14—straight,	3,800	"
No. 15—curve to left —radius 1910 feet,	2,100	"
No. 16—straight,	12,400	to No. 17.

From this table, we perceive that 79800 feet of this line are perfectly straight, and only 13700 curved, the whole length being 93500 feet, very nearly 18 miles. Again—of the curved portion, 6500 feet have a radius of 5730 feet—more than a mile; five thousand one hundred a radius of 2865 feet—more than half a mile; and only two thousand one hundred feet with a radius as small as 1910 feet. This last is the only objectionable curve on the line, and was necessarily adopted to avoid very heavy cutting. With the exception of these 2100 feet, a locomotive can pass as fast, and draw very nearly as heavy trains through the whole line, as though the road were perfectly straight.

As the numbers of the last table afford convenient marks of reference, let me here introduce a few remarks relative to the construction of the work, and the nature of the country through which it passes. Between points Nos. 1 and 2, nothing remarkable occurs—the whole consists of cutting from three to six feet—the soil principally clay. Between 2 and 3, is encountered a swamp, or highland slash, which was found very troublesome, being completely covered with water during winter and spring, and in summer, baked so hard, that a pick could scarcely penetrate the soil. The clearing through this swamp was very heavy. In this distance, also, is crossed Fontaine's creek. Over this stream is erected one of the handsomest stone structures in this country—now on the Raleigh and Gaston road. This viaduct is built of most beautiful granite, which was found in abundance at a distance of about three miles. At the roadway level, the bridge is one hundred and eighty feet long, and only six feet wide—the plate of the rail, being about forty-two feet above the surface of the water. The span, or archway, is sixty feet, and each abutment has a length of sixty feet. The abutments for the twenty feet next to the arch, are founded on solid rock, and have such a base, that with a batter, or slope, on each side, of one inch to the foot, they dwindle to a width of six feet, by the time they reach the level of the roadway. Over the whole is put a coping, beautifully cut, one foot in thickness, which projects on either side, six inches, which gives the bridge the appearance of being seven feet wide. This bridge is remarkable for its light and graceful appearance, being only seven feet deep from the top of the coping to the crown of the arch, or the stone work being only seven feet thick just above the crown or highest point of the arch, so that it looks as if it were actually suspended in the air. And yet there can be no manner of doubt as regards its strength or safety. The ring stones are two and a half deep, and measure two feet on the inner, and two feet two inches on the outer circle—the beds or joints of these ring-stones are cut perfectly smooth, as well as their faces, and they lie so nearly in contact, that it is almost impossible to run the blade of a knife between them.

Such an arch supported by abutments sixty feet long, and founded on rock, will resist any pressure insufficient to crush the granite to dust. There are about one thousand eight hundred perches of stone in this structure, and the whole cost was about $10,500 —which, when we consider that the stone had to be conveyed three miles, is very moderate. The embankment at either end of this bridge is very heavy—about thirty-six feet high, and in all, contains two thousand eight hundred cubic yards of earth.

From No. 4 to 5, there is a beautiful straight stretch of nearly four miles. The cutting in several places on this portion, is as much as twelve feet. Where the line crosses the head of Lynch's swamp, the ridge being much to the right, there is a very heavy embankment, thirt,-four feet high in its deepest part, and containing nearly five thousand eight hundred cubic yards. Under this bank there is an arched culvert, (six feet span, ninety feet long, and containing three hundred to three hundred and fifty perches,) which is a most beautiful specimen of masonry. The cuts on this portion, were principally of clay. In them were sometimes encountered large isolated blocks of granite, measuring from five to ten feet in diameter, which had the appearance of having been, at one time, much subjected to the friction of water. At one place, also, the earth is impregnated with a good deal of iron ore, which rendered it exceedingly hard.

From No. 6 to 7, the first half is heavy cutting, the remainder a heavy bank. Here after sinking the cuts eight or ten feet, through clay, there was reached a stratum of sand, which scarcely needed the plough or pick. On this portion is situated the first depot, seven and a half miles from the junction of the two roads, and midway between Belfield and Gaston.

The short curve from No. 7 to 8, is on a heavy bank.

From No. 8 to 15, which includes all that portion of the railroad from near Puckett's cross roads, to the summit, near the Roanoke, a distance of seven miles, the location is most favorable—the country at one time, undulating so gently and regularly, that the hills just serve to fill up the small valleys, and at another, so regular and level, that the roadway scrapes along the surface, sometimes a foot or two above, at others a fovt or to below. The texture of the soil, very sandy and light.

Between No. 12 and 13, there is a second depot. Another temporary depot is constructing at 15.

The curve from No. 13 to 14, brings you to the proper direction for striking the head of the ravine, by which the descent is made to the Roanoke, and the curve from 15 to 16, brings you into the direction of that ravine. This ravine is then followed to the flats of the the river, and the same straight line pursued across these flats, which are here three-fourths of a mile wide, to the river.

From 15 to a point one thousand four hundred feet south of 16, there is a heavy cut, as much as thirty-one feet deep in one place, and containing nearly seventy thousand cubic yards. The top is of a stiff clay the middle third stiff clay mixed with large gravel—and the lower third, a mixture of clay and sand—the sand however prevailing Next to this cut, the work consist principally of heavy embankment, till you reach the flats, across which there is a bank averaging about eight feet high.

After passing through the last curve, on reaching point No. 16 a spectacle no less remarkable than beautiful strikes the eye. The straight stretch of road does not stop at the river, but continues on in the same straight line, nearly to the summit on the other side—a thing unparelleled in the annals of railroads: not only that a perfectly straight line could be obtained in the descent on this side—but that a valley should be so disposed on the opposite side, that this straight line, continued, should afford the very best location for the ascent to the next summit—and this too across a valley, the flats of which are two hundred feet below the summit on either side. This straight line, when completed, will be three and a half miles long, and the Roanoke bridge, when completed, which is now in the course of construction, will greatly add to the beauty of the view.

About the last seven hundred feet of the straight line between No. 16 and 17, is a part of the Raleigh and Gaston Railroad. Just before reaching the Roanoke, the Greensville road curves down the river and runs into a noble warehouse, which is now constructing, three hundred feet by sixty.—This depot is immediately on the water's edge, and the wharf, only fifteen feet wide, will reach water sufficiently deep to float the largest batteaux. Cranes will be fixed on the wharf for raising produce from the boats to the level of the floor of the warehouse, which is made as high as the beds of the cars, so that the produce can be loaded on them, with but little additional trouble or expense.

At the point where the continuation of this straight line strikes the Roanoke, the river is about one thousand feet wide at the water level. A bridge is now constructing across it, which will be completed in the course of the coming year—built on the plan of Townes' lattice bridge, with double lattice, to consist of six pans—the piers and abutments of the finest granite, which is found here in the greatest abundance. These piers and abutments will be founded on the solid rock which forms the bed of the river. Along the whole of this line, stone is found in great abundance and of the best quality. This was a most fortunate circumstance, for on the latter half of the road, the number of drains is almost unprecedented. Wherever the line varies the least from the summit of the ridge, the head of some small ravine is crossed, which calls for at least a dry stone drain. The item of hauling, even now, is very considerable, but had stone been scarce, or only found at a distance, the expense of all the masonry, would have been very much increased. This stone most frequently occurs in the shape of large isolatedb locks, chiefly of granite, varying much in degrees of hardness.

Located as this road is, between two creeks, an abundant supply of white oak sills was easily obtained. Rails had to be obtained at a greater distance; but the Petersburg Railroad and the Roanoke river furnished ready means for their delivery at either end of the line. Thence they had to be wagoned to the points at which they were wanting.

Points of reference.	Elevation above tide.	Length of grade.	Rate per mile.	Total ascent or descent.	Ascends, descends, or is level.
1	141.40	3219	19	11.50	ascends
2	192.90	4100	13.70	10.66	descends
3	142.24	1000	level	0.00	level
4	142.24	8750	32.20	53.37	ascends
5	195 61	2000	5.80	2.20	descends
6	193.41	8800	32.20	53.68	ascends
7	247.09	3000	15.84	9.00	descends
8	238.09	3824	32.20	23.33	ascends
9	261.42	5043	15.84	15.13	descends
10	246.29	6141	32.20	37.46	ascends
11	283.75	3150	level	0.00	level
12	283.75	3600	10.56	7.20	descends
13	276.55	3570	level	0.00	level
14	276.55	2100	24.82	9.87	ascends
15	286.42	6300	3.70	4.41	ascends
16	290.83	800	level	0.00	level
17	290.83	1800	12.67	4.32	ascends
18	295.15	2900	level	0.00	level
19	295.15	2800	12.67	6.72	ascends
20	301.87	2404	level	0.00	level
21	301·87	2200	16.37	6.82	ascends
22	308.69	2105	level	0.00	level
23	308.69	500	50.16	14·25	descends
24	294.44	9100	93.45	161.41	descends
25	133.00	3200	level	0.00	level
26					

Grades.—The above table shows the beauty of the grades on this road. The first column contains mere points of reference, not corresponding to the similar numbers in the last table, but as those denoted points of curve, or changes of direction, so these the changes of grade. The second column, the elevation above tide water at Petersburg, of the point on the same line. The third, the length of grade from the point opposite, to the point in the next line. The fourth, the rate per mile. The fifth, the total ascent or descent in that distance. And the sixth, whether the grade rises, falls, or is level.

No. 1, is at the junction of the two roads. No. 26, at the Roanoke. From an inspection of this table, the reader will see that all the grades are as easy as is desirable, till we come to point No. 23. From 23 to 25, the grade is very heavy. At No. 1, you will perceive the elevation above tide, is 141.40 feet—at No. 23, 308.70 feet—and at 25, the elevation is 133 feet—about 8 feet below the point of commencement: so that from 23 to 25, a distance of only 10600 feet, the road had to descend through a greater space than it had risen in all the distance between 1 and 23. The great difficulty here, arises from the fact of the summit approaching so near the Roanoke, that enough *distance* is not allowed for an easier descent. Even with the present grade, there is as much as 30 feet cutting at its head, and 12 feet filling at its foot. Pre-